

PATENT SPECIFICATION

1,154,101

DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvement in or relating to Washing Apparatus, including a Travelling Band Filter.

We, METALWASH MACHINERY CORPORATION, of 901, North Avenue, Elizabeth, State of New Jersey, United States of America, a corporation duly organized under the laws of the State of New Jersey, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to washing apparatus including a travelling band filter. According to the invention, there is provided a washing apparatus comprising an arrangement for filtering and recirculating used washing liquid, said arrangement comprising an endless, foraminous, flexible travelling filter band, a stationary track assembly, said filter band being mounted on said track assembly, means for moving and guiding said filter band in a stepwise movement, said filter band hanging loosely downwardly from said track assembly and having a length large enough to permit an operator to lift said filter band away from said track assembly and to replace it on said track assembly without in any way displacing said track assembly; means for delivering used washing liquid from a washing station of the apparatus on to a portion of said filter band, a tank communicating with the underside of said portion of said filter band for receiving washing liquid filtering therethrough and circulating means communicating with said tank for circulating said liquid from said tank back to the washing station.

According to one refinement of the invention, the travelling filter band has an upper and a lower run, said band being moved longitudinally through said upper and lower runs, wherein said washing station is

arranged generally above said upper run, the said means for delivering used washing liquid being arranged to deliver it from said washing station with entrained solids onto said upper run, and means adjacent to one end of the runs for removing debris collected on said upper run before the portion of said band carrying said debris passes into said lower run.

According to another refinement of the invention, the filter band is positioned substantially horizontally and has an upper and a lower run, said band being moved longitudinally through said upper and lower runs, wherein said washing station is arranged generally above said upper run, the said means for delivering used washing liquid being arranged to deliver it from said washing station with entrained solids on to said upper run, and said lower run being shaped in a substantially catenary-like form for immersion in the liquid in said tank.

Embodiments of the invention will now be more particularly described, with reference to the accompanying drawings, in which:—

Fig. 1 is a simplified perspective illustration of one possible embodiment of an apparatus according to the invention;

Fig. 2 is a longitudinal sectional elevation of the apparatus of Fig. 1, the section of Fig. 2 being taken through a tank from which the wash liquid is recirculated back to the articles for washing the latter.

Fig. 3 is a sectional plan view of the apparatus, the section of Fig. 3 being taken at an elevation beneath the top of the entire assembly but high enough to illustrate the details of the structure of the invention;

Fig. 4 is a fragmentary sectional elevation on an enlarged scale, as compared to the

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preceding figures, taken along line 4—4 of Fig. 3 in the direction of the arrows and illustrating the structure of a movable filter band means of the invention;

5 Fig. 5A is a transverse section of the structure of Fig. 4 taken along line 5A—5A of Fig. 4 in the direction of the arrows;

10 Fig. 5B is a fragmentary section taken at the same location as Fig. 5A, but showing a different embodiment;

Fig. 6 is a fragmentary transverse section of the apparatus illustrating the manner in which it can be serviced by an operator.

15 Fig. 7 is a further fragmentary transverse section illustrating how the apparatus can be further serviced by an operator;

20 Fig. 8 is a fragmentary longitudinal section, on an enlarged scale as compared to the preceding figures, illustrating the manner in which fluid carrying the debris removed from the filter can be handled;

25 Fig. 9 is a fragmentary longitudinal section illustrating a further embodiment of a structure for handling the fluid which carries the debris away from the filter as well as a further embodiment of a driving structure for operating a reciprocating means which moves the filter band of the invention in a stepwise manner;

30 Fig. 10 shows another embodiment of a driving structure for the filter band;

Fig. 11 schematically illustrates a further type of machine capable of using the structure of the present invention;

35 Fig. 12 is a schematic illustration of yet a further type of machine which may be provided with the structure of the invention; and

40 Fig. 13 shows yet another type of machine which may receive the structure of the invention.

Referring to Fig. 1, the embodiment of the invention illustrated therein takes the form of the apparatus 10 provided with elongated hollow housing 12 in which the articles are washed. These articles may be any type of dishes, pans, pots, or the like, and the apparatus of the invention is particularly suited for baking pans. The elongated hollow housing 12 has a removable cover 14 and at one end an entrance opening 16 through which the articles to be washed are introduced. This opening 16 gives access to the article-conveying means 18 in the form of an elongated endless band of mesh construction formed from any suitable wire or plastic mesh having openings large enough to provide for practically unrestricted flow of washing liquid through the runs of the endless article-conveying means 18. The housing 12 has opposed side walls 20, and these walls 20 provide bearings for the shafts 24 and 26 which carry, for example, sprocket wheels 22 whose teeth enter into sprocket chains fixed to and forming the outer side

edges of the endless article-conveying means 18.

By rotation of the sprockets the endless band 18 is advanced with its upper run moving away from the opening 16 from left to right, as viewed in Fig. 1, and the washed articles are removed from the right end of the band 18 which is freely accessible through an opening in the housing 12, as is apparent from Fig. 1.

70 A bank of spray pipes 28 extends transversely across the upper run of the article-conveying means 18 while a lower bank of spray pipes 30 extends between the runs of the band 18, this lower bank of pipes 30 having upwardly directed nozzles through which the washed liquid is directed upwardly through the band 18, at its upper run, while the pipes 28 have downwardly directed nozzles for directing the sprays of washing liquid downwardly. The upper bank of spray pipes 28 receive wash liquid from a header 32, while the lower bank of pipes 30 receive liquid from a header 34, and both of these headers communicate with the output of a pump 36 driven by a motor 38. The pump 36 is submerged within a filtered body of cleaning liquid situated in a tank 40 which in part extends beneath the housing 12 and in part extends laterally beyond the housing 12.

As may be seen from Fig. 2, at the end of the apparatus from which the washed articles are received there is a suitable supporting frame 42 carrying a motor 44 which drives a sprocket 46 which through a chain 48 drives a sprocket 50 fixed to the shaft 26 so as to rotate the latter and thus drive the article-conveying means 18. The shaft 26 rotates in a clockwise direction, as viewed in Fig. 2, so that the upper run of the conveyor 18 advances from the left toward the right, as viewed in Fig. 2.

110 Situated beneath the conveyor 18 within the housing 12 is a drain plate 52 which is large enough to extend completely beneath and somewhat beyond the entire conveyor 18 up to the side walls and end walls of the housing 12. This drain plate 52 is inclined downwardly from the ends of the housing 12 toward the center thereof, as is apparent from Fig. 2, and in addition the drain plate is inclined transversely, as is apparent from Fig. 6. Thus, the right wall 20 of the housing 12, as viewed in Fig. 6, this being the wall 20 which is visible in Figs. 1 and 2, is formed not only with an opening 54 through which these spray pipes 30 extend from the header 34, but in addition this side wall 20 is formed with an opening 56 which has the elongated rectangular configuration most clearly shown in Fig. 2 and through which an edge portion of the drain plate 52 extends. This drain plate is laterally inclined downwardly toward the opening 56, so that, as

viewed in Fig. 6, the right edge of the drain plate 52 is lower than its left edge which is not visible in Fig. 6. As a result all of the wash liquid will be received by the drain plate 52 and will be directed out of the housing 12 through the opening 56.

Fig. 6 also shows the angle members 58 which extend along the side walls of the housing 12 at the interior thereof for guiding the side edges of the endless conveyor band 18. Also, Fig. 6 shows one of a pair of upper elongated angle members 60 carried by the side wall 20 visible in Fig. 6 and serving to support one edge of the removable cover 14 whose opposite edge is supported in precisely the same way at the other wall 20 of the housing 12.

As may be seen from Fig. 6, a cantilever type of support member 62 is fixed to the underside of the drain plate 52 and extends laterally therefrom to the portion of the tank 40 which is accessible beyond the housing 12. This portion of the tank 40 has an open top so that the operator can have access to the interior of the tank 40 at its portion which extends laterally beyond the housing in the manner indicated in Fig. 6. A pair of these cantilever type of support members 62 form a support means for a track assembly 64, and the distance between the pair of members 62 of the support means is apparent from Fig. 2, as well as Fig. 1. At their free ends the support members 62 have upwardly directed projections which serve to retain the track assembly 64 on the support members.

The track assembly 64 is formed by a pair of elongated track members 66 in the form of angle irons having in cross section the configuration most clearly apparent from Figs. 5 and 6. These elongated track members 66 simply rest on the support means 62, and they are provided with curved ends 68 the configuration of which is most clearly apparent from Fig. 2. Struts 70 are provided to reinforce the curved ends 68 of the track 64, and it will be noted that the upper ends of the struts 70, as viewed in Fig. 2, are situated closely adjacent to the pair of support members 62, so that by simply resting the angle members 66 of the track assembly 64 on the members 62, the struts 70 cooperate with these members 62 to avoid any substantial longitudinal shifting of the track assembly 64. In addition, as is shown in Fig. 6, transversely extending reinforcing members 72 connect members 66 at the free ends of the track assembly 64.

This track assembly 64 serves to support and guide a filter band means of the invention which includes the endless, flexible, foraminous filter band 74 made of any suitable wire or plastic mesh, for example. It is preferred, however, to make the mesh band of stainless steel and the tracks 66 of

a softer material, such as brass. The width of the endless band 74 of course corresponds to the distance between the track members 66, and, as is apparent from Fig. 2, in particular, the endless filter band 74 is not only guided along the track elements 66 and around the curved ends 68 thereof, but in addition the length of the endless filter band 74 is such that it hangs loosely down from the track assembly in the manner shown most clearly in Fig. 2.

In order to move the filter band 74 along the track assembly 64, the band 74 fixedly carries at regular intervals therealong cleats 76 which extend at least part of the way transversely across the band 74. In the illustrated example these cleats extend all the way across the band, and are generally coterminous with the sides of the band 74 and they are fixed thereto either in the manner shown in Fig. 5A or as shown in Fig. 5B. Thus, each cleat 76 is in the form of an elongated angle member which can move freely between the track members 66, and each angle member 76 has a wall directly engaging the outer surface of the endless band 74 and a second wall projecting from the band 74. The band-engaging wall of each cleat 76 is situated directly over a transverse backing plate or bar 78 situated at the side of the band 74 opposite from the cleat 76, and which, like cleat 76, is generally coterminous with the sides of the band 74. Suitable rivets 80 serve to fix the cleats 76 respectively to the bars 78, so that in this way the band 74 is clamped between the elements 76 and 78 and is not stressed by any connection of the cleats 76 directly to the band itself. In addition, it will be noted from Fig. 5A that with this construction it is the free ends of the transverse bars 78 which directly engage and slide along the angle members 66 of the track assembly 64, and since these free ends of the bars 78 are quite smooth, the frictional resistance to movement of the band is quite low. However, in order to avoid any gaps between band 74 and the inner webs of angle members 66, shorter bars 78¹ may be used, as shown in Fig. 5B, having a length smaller than the distance between tracks 66, so that the band 74 directly engages the latter.

A reciprocating means 82 (Fig. 2) cooperates with the successive cleats 76 for advancing the band 74 in a stepwise manner. This reciprocating means 82 includes, as shown most clearly in Fig. 4, an elongated rod 84 which forms part of a pawl assembly which includes the tooth member 86 situated at the free end of the rod 84. This tooth 86 has an inclined lower surface, as viewed in Fig. 4, enabling the tooth 86 to ride over a cleat, as is apparent from Fig. 4, and then the left end face of the tooth 86 engages the right surface of the cleat, as viewed in Fig. 130

4, so that when the rod 84 is shifted to the left, as viewed in Fig. 4, the band 74 will, at its upper run, also be shifted to the left, while when the rod 84 is shifted to the right the band will remain stationary while the tooth 86 rides over the next cleat.

The rod 84 is pivotally connected to the free end of a second rod 88 which carries a limiting member 90 which limits clockwise pivotal movement of the rod 84 to the solid line position shown in Fig. 4. Therefore, the rod 84 cannot move downwardly beyond the horizontal elevation thereof shown in Fig. 4, although this rod 84 can be tilted up to the dot-dash line position indicated in Fig. 4 for a purpose referred to below.

As may be seen from Fig. 2, the rod 88 is guided for longitudinal movement through a sleeve 92 fixedly carried by a wall of the tank 40, and this rod 88 is pivotally connected at its left end, as viewed in Fig. 2, to a connecting rod 94 which is in turn pivotally connected to a rotary disc 96 which is fixed to the rotary shaft 98 which is carried for rotation by a suitable bearing mounted on the side wall 20 which is visible in Fig. 1. Because the connecting rod 94 is pivotally connected to the disc 96 at a location spaced from the shaft 98, which is fixed to the central portion of the crank disc 96, the radius between the shaft 98 and the pivotal connection of the connecting rod 94 to the disc 96 forms a crank arm driving the connecting rod 94 and reciprocating the rod 88 back and forth so as to produce the stepwise movement of the band 74 in the manner described above. The shaft 98 fixedly carries a sprocket driven by an endless sprocket chain 100 which is in turn rotated by a sprocket wheel 102 fixed to the shaft 24 at a part thereof which extends outwardly beyond the housing 12. Therefore, it will be seen that the upper run of the article-conveying means 18 serves not only to support articles while they are washed but in addition it transmits the drive from the shaft 26 to the shaft 24 so that the article-conveying means also acts as part of a transmission to the reciprocating means 82 for actuating the latter to drive the endless filter band 74.

It is not essential, however, to drive the filter band from the conveyor 18, and Fig. 9 shows an arrangement where a motor 104 reciprocates a rod 106, connected to and reciprocating the rod 88 so as to advance the band 74, in a stepwise manner. This motor 104 may be a hydraulic motor in which a piston is reciprocated back and forth in a well known manner, or the motor 104 may be a pneumatic motor in which the piston is reciprocated back and forth by alternately applying air pressure automatically to the opposed faces of the piston, as is well known in pneumatic motors of this type.

Because of the construction of the track assembly and the length of the endless band 74 with respect to the track assembly 64 the operator can at any time lift the band off the track without in any way disturbing the track itself, as is indicated in Fig. 6, and for this purpose the operator need only swing the rod 84 up to the dot-dash line position indicated in Fig. 4, so as to facilitate removal of the endless band. In this way from time to time, as required, the endless band may either be replaced or may be manually cleaned when the machine is not operating. Also, whenever any repairs of the fastening of the cleats to the band is required the manipulations illustrated in Fig. 6 render such repairs extremely convenient to carry out.

At relatively longer intervals there may collect on the tracks 66 themselves sufficient debris to warrant cleaning of these tracks, and it will be noted from Fig. 7 that after the band 74 has been removed the track assembly itself can simply be lifted away from the support means 62 without in any way disturbing the latter, so that the track assembly 64 also is very easy to clean, and, once cleaned, can simply be replaced on the cantilever-type of support members 62 so that the band can then be replaced and the operations resumed. Also, removal of the track assembly 64 gives easy access to the interior of the tank for servicing purposes.

During operation of the apparatus of the invention debris washed from the articles conveyed through the apparatus will collect on the filter band as the dirty washing liquid drains out of opening 56 and through band 74 leaving the debris thereon, and in accordance with a further feature of the invention this debris is continuously removed from the filter band so that the band is maintained at all times at substantially its peak performing capability. For this purpose a band cleaning means in the form of a pipe 108 is provided, this pipe 108 extending between the runs of the endless band 74 and being situated in the illustrated example adjacent the left end of the band, as viewed in Fig. 2. As may be seen from Fig. 4, the pipe 108 is provided with a plurality of spray nozzles 110, and this pipe 108 is closed at its free end but at its other end communicates with a suitable source of fluid under pressure such as a suitable cleaning liquid or even air without any liquid, although a fluid such as steam would also be suitable. The spray nozzles 110 are distributed all the way across the width of the band 74 so that the band cleaning fluid will spray through the band 74 toward the left end wall of the tank 40, as viewed in Fig. 2. In this way the band is continuously cleaned as it is advanced in a stepwise manner by the reciprocating

of spray pipes 30b diagrammatically indicated in Fig. 12. The machine 10B also has an upper bank of spray pipes 28b as well as vertically arranged banks of pipes 31. In this case also the washing liquid drops onto the drainage plate 52b which drops the washing liquid to the structure of the present invention, which indicates that Fig. 12 can be also precisely as described above.

In Fig. 13 the machine 10C has article conveying means 18c in the form of a rotary perforated drum 180 which receives the articles C in its interior and which surrounds a spray pipe 28c from which the washing liquid is directed onto the articles in the rotary drum 180 as diagrammatically illustrated in Fig. 13. The washing liquid in this case also is received by the drainage plate 52c which directs it to the structure of the invention which in the case of Fig. 13 also can have precisely the same structure as that described above.

The guiding of the endless band 74 on the stationary tracks 66, according to the invention, eliminates the necessity of providing guide rollers, shafts, bearings, etc. for the band.

WHAT WE CLAIM IS:—

1. Washing apparatus comprising an arrangement for filtering and recirculating used washing liquid, said arrangement comprising an endless, foraminous, flexible travelling filter band, a stationary track assembly, said filter band being mounted on said track assembly, means for moving and guiding said filter band in a stepwise movement, said filter band hanging loosely downwardly from said track assembly and having a length large enough to permit an operator to lift said filter band away from said track assembly and to replace it on said track assembly without in any way displacing said track assembly; means for delivering used washing liquid from a washing station of the apparatus on to a portion of said filter band, a tank communicating with the underside of said portion of said filter band for receiving washing liquid filtering there-through, and circulating means communicating with said tank for circulating said liquid from said tank back to the washing station.

2. Washing apparatus as claimed in claim 1, wherein said travelling filter band has an upper and a lower run, said band being moved longitudinally through said upper and lower runs, wherein said washing station is arranged generally above said upper run, the said means for delivering used washing liquid being arranged to deliver it from said washing station with entrained solids on to said upper run, and means adjacent to one end of the runs for removing debris collected on said upper run before the portion of said band carrying said debris passes into said lower run.

3. Washing apparatus as claimed in claim 1, wherein said filter band is positioned substantially horizontally and has an upper and a lower run, said band being moved longitudinally through said upper and lower runs, wherein said washing station is arranged generally above said upper run, the said means for delivering used washing liquid being arranged to deliver it from said washing station with entrained solids on to said upper run, and said lower run being shaped in a substantially catenary-like form for immersion in the liquid in said tank.

4. Washing apparatus as claimed in claim 2, wherein said means for removing debris from said upper run is located below said upper run adjacent to one end thereof and comprises means for directing a stream of fluid under pressure against a portion of the underside of said filter band.

5. Washing apparatus as claimed in claim 2, said filter band being entirely disposed within said tank, said upper run extending over the liquid level therein, including separate debris receiving means adjacent one end of the runs and said means for removing the debris from said upper run further comprising means for directing debris into said separate receiving means.

6. Washing apparatus as claimed in claim 1, further comprising means for freely and removably supporting said track assembly in said tank, said tank including an access above the liquid level in the tank for removing and replacing said filter band and for removing and replacing said track assembly.

7. Washing apparatus as claimed in claim 1, wherein said stationary track assembly includes first and second laterally spaced tracks each having elongated substantially horizontal track portions and each having downwardly curved front and rear end track portions adjacent both ends of the upper run respectively of said filter band, said tracks constituting means for supporting and guiding the respective sides of said filter band for sliding movement along said substantially horizontal portions and around said front and rear curved portions.

8. Washing apparatus as claimed in claim 7, wherein said filter band comprises a plurality of structural elements attached to the band and extending transversely across said band between said tracks and vertically relative to the plane of said filter band, said elements comprising means for cooperative engagement with said means moving said filter band, and said means for moving said filter band comprising reciprocating means for successively engaging said elements.

9. Washing apparatus as claimed in claim 8, wherein said structural elements are angle pieces, and one leg of each thereof is secured to said filter band with ends thereof being

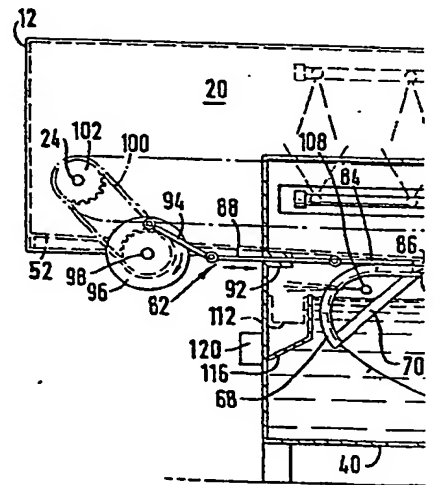
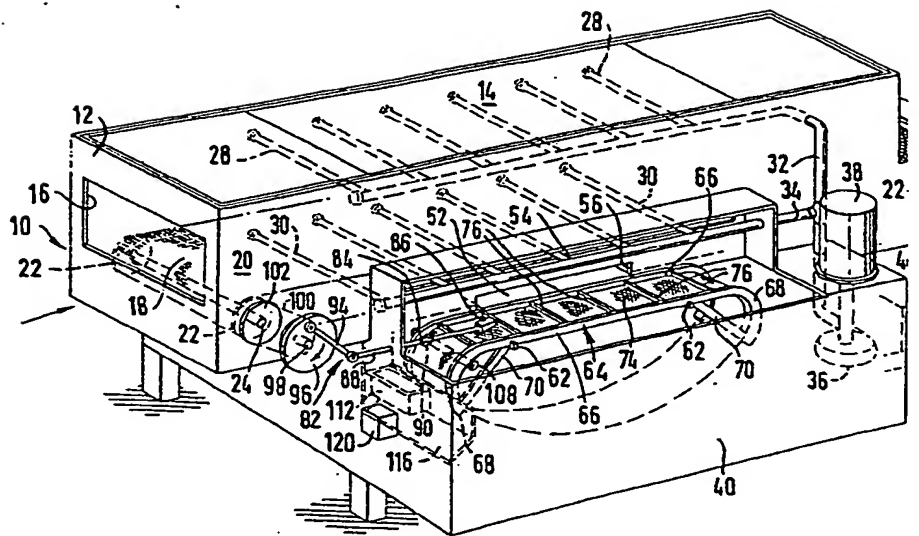
substantially coterminous with the sides of
said filter band.

10. Washing apparatus substantially as
hereinbefore described with special reference
5 to the accompanying drawings.

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FIG. 1.



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3 SHEETS

Sheet 1

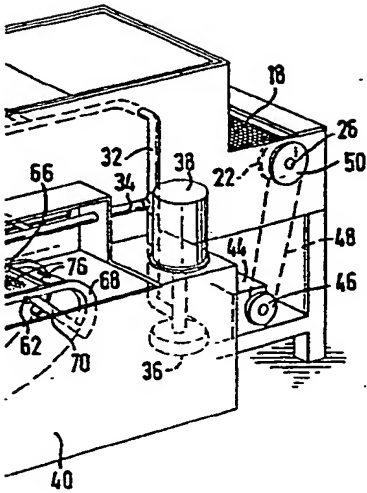
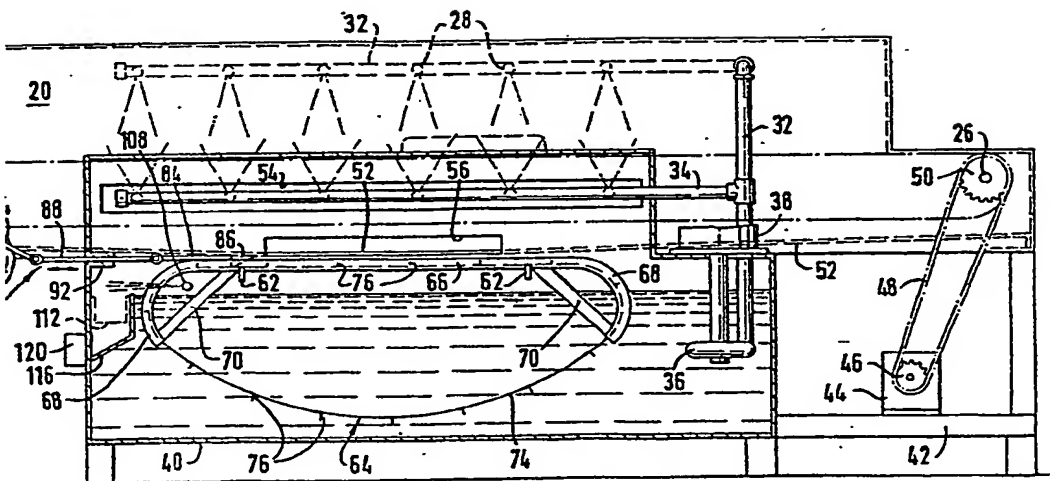


FIG. 2.



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FIG.1.

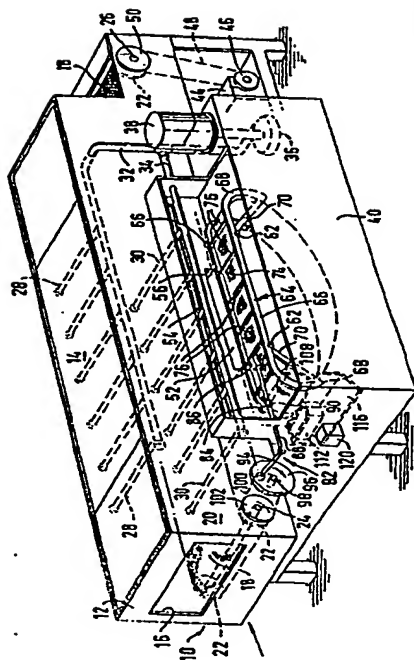
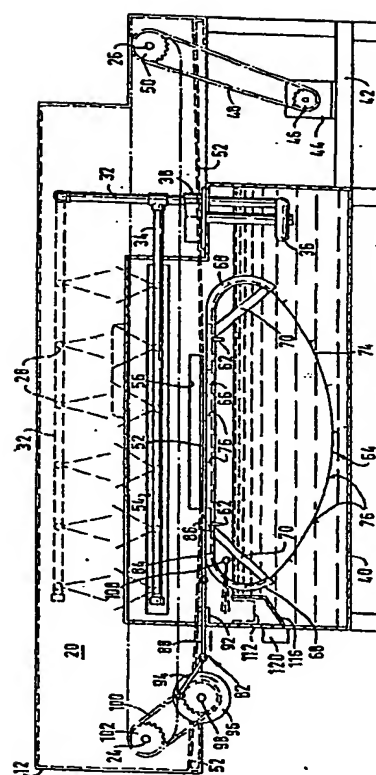


FIG.2.



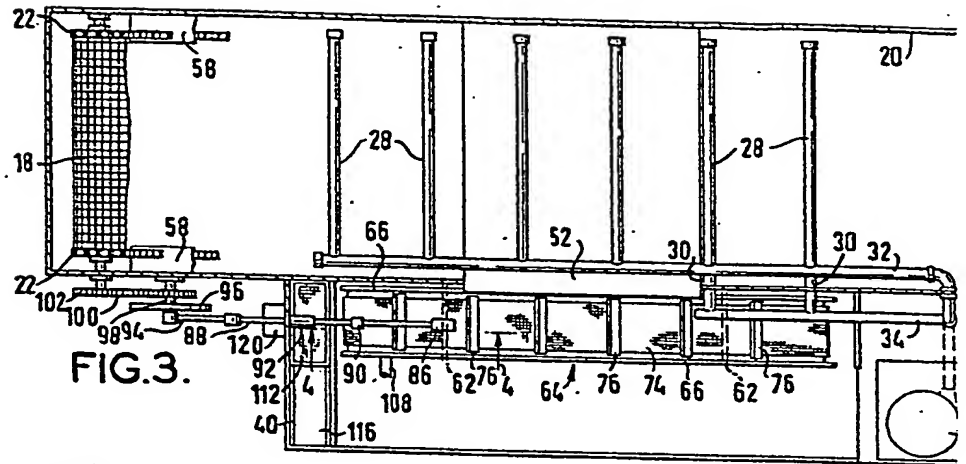


FIG. 3.

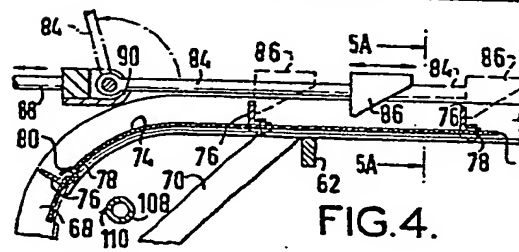


FIG. 4.

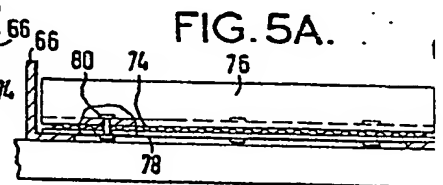
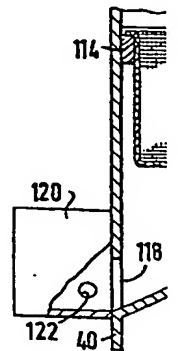
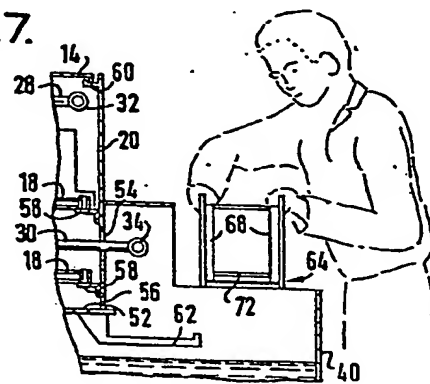


FIG. 5A.

FIG. 7.



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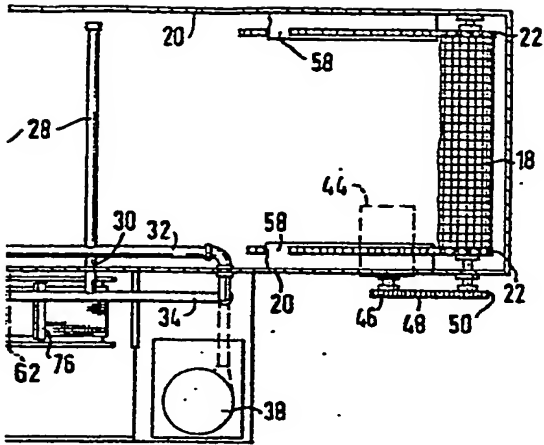


FIG. 5A.

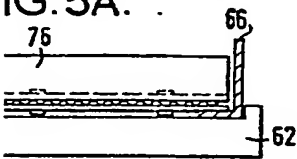


FIG. 5B.

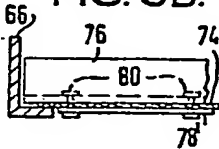


FIG. 6.

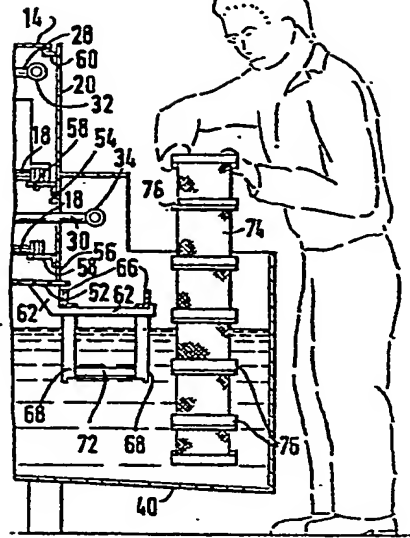


FIG. 9.

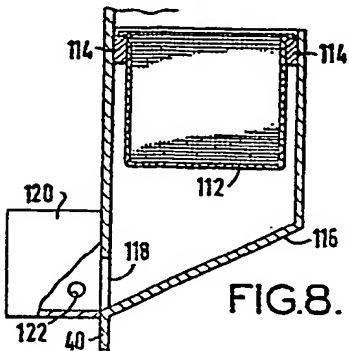
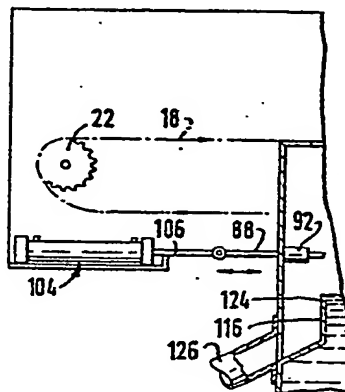


FIG. 8.

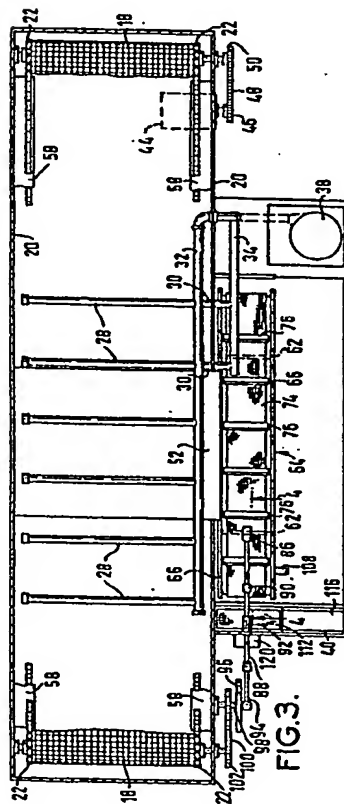


FIG. 3.

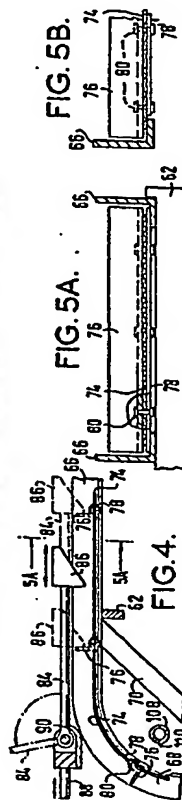


FIG. 5B.

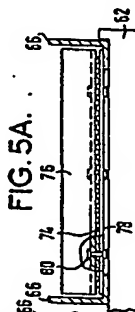


FIG. 5A.



FIG. 4:

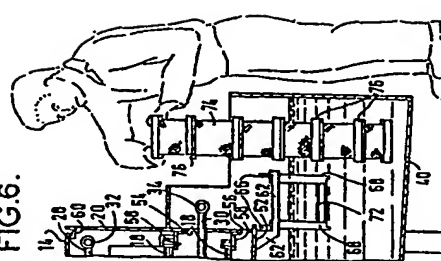


FIG. 6.

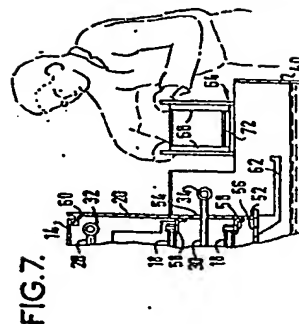


FIG 7

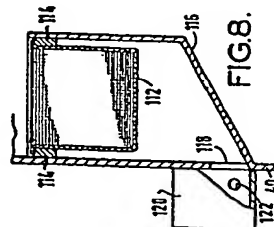
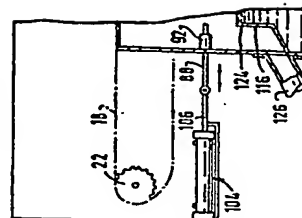


Fig. 8.



6.6.3

